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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER

LEWIS, MONICA

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 11/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n N .

09/846,127

Applicant(s)

CHEN ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 21-40 is/are pending in the application.
- 4a) Of the above claim(s) 18-20, 41-71 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 21-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the amendment filed August 7, 2002.

Response to Arguments

2. Applicant's arguments with respect to claims 1-17 and 21-40 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Hu (U.S. Patent No. 6,328,620).

In regards to claim 1, Simmons discloses the following:

- a) an electron supply (34) (See Figure 1);
- b) a cathode layer (22) (See Figure 1); and
- c) a tunneling layer (27) disposed between the electron supply and the cathode layer (See Figure 1).

In regards to claim 1, Simmons fails to disclose the following:

- a) the electron supply, cathode layer, and tunneling layer have been subjected to an annealing process.

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However, Hu discloses an annealing process (See Column 3 Lines 45-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an annealing process as disclosed in Hu because it aids in enhancing the emission of electrons.

In regards to claim 13, Moyer discloses the following:

- a) a substrate (See Figure 1); and
- b) emitter disposed on the substrate (See Figure 1).

In regards to claim 13, Moyer fails to disclose the following:

- a) circuitry for operating the emitter formed on the substrate with the emitter.

However, Hu discloses a control device (See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a control device as disclosed in Hu because it aids in controlling the field emission.

In regards to claim 14, Moyer discloses the following:

- a) the emitter capable of emitting energy (See Figure 1);
- b) an anode (32) structure capable of receiving the emitted energy and generating at least a first effect in response to receiving the emitted energy and a second effect in response to not receiving the emitted energy (See Figure 1).

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5. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Hu (U.S. Patent No. 6,328,620) and Potter (U.S. Patent No. 5,703,380).

In regards to claim 2, Simmons fails to disclose the following:

a) tunneling layer is a metal cluster dielectric.

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

In regards to claim 3, Simmons fails to disclose the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , $WSiN$, $TaAlO_xN_y$, $TaAlO_x$, and AlO_xN_y .

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

In regards to claim 4, Simmons fails to disclose the following:

a) cathode layer is selected from the group consisting of platinum, gold, molybdenum, tantalum, iridium, ruthenium, chromium, and alloys thereof.

However, Potter discloses layers of gold, tantalum and molybdenum (See Column 9 Lines 23-37). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include layers of gold,

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tantalum and molybdenum as disclosed in Potter because it aids in providing good electromigration properties.

6. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Hu (U.S. Patent No. 6,328,620) and Chuman et al. (U.S. Patent No. 6,023,124).

In regards to claim 5, Simmons fails to disclose the following:

a) emission current of greater than 1×10^{-2} Amps per square centimeter.

However, Chuman et al. ("Chuman") discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

Additionally, the applicant has not established the critical nature of the emission current of greater than 1×10^{-2} Amps per square centimeter. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 6, Simmons fails to disclose the following:

a) emission current of greater than 1×10^{-1} Amps per square centimeter.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

Additionally, the applicant has not established the critical nature of the emission current of greater than 1×10^{-6} Amps per square centimeter. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 7, Simmons fails to disclose the following:

a) emission current of greater than 1×10 Amps per square centimeter.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

Additionally, the applicant has not established the critical nature of the emission current of greater than 1×10 Amps per square centimeter. "The law is replete with cases in which the

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difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

7. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Hu (U.S. Patent No. 6,328,620) and Liu et al. (U.S. Patent No. 6,118,136).

In regards to claim 8, Simmons fails to disclose the following:

a) tunneling layer has a thickness less than about 500 Angstroms.

However, Liu et al. (“Liu”) discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 500 Angstroms. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 9, Simmons fails to disclose the following:

a) tunneling layer has a thickness less than about 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 250 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 10, Simmons fails to disclose the following:

a) tunneling layer has a thickness less than about 100 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 100 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that

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the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 11, Simmons fails to disclose the following:

a) tunneling layer has a thickness of about 50 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 50 Angstroms. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 12, Simmons fails to disclose the following:

a) tunneling layer has a thickness within the range of 50 to about 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 50 to about 250 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Hu (U.S. Patent No. 6,328,620), Xia (U.S. Patent No. 6,034,479) and Gibson et al. (U.S. Patent No. 5,557,596).

In regards to claim 15, Simmons fails to disclose the following:

a) reading circuit.

However, Xia discloses a reading circuit (See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a reading circuit as disclosed in Xia because it aids in controlling a source of power.

b) electronic device is a mass storage device and the anode structure is a recording medium.

However, Gibson et al. ("Gibson") discloses a memory device that has an anode storage area (See Column 2 Lines 1-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a storage medium as disclosed in Gibson because it provides a medium to store data.

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9. Claim 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simmons et al. (U.S. Patent No. 5,825,049) in view of Hu (U.S. Patent No. 6,328,620), Xia (U.S. Patent No. 6,034,479).

In regards to claim 16, Simmons fails to disclose the following:

a) electronic device is a display device.

However, Xia discloses a field emission display device (See Column 1 Lines 29-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a display device as disclosed in Xia because field emission is important in providing good portable screens with good display characteristics.

b) the anode structure is a display screen that creates a visible effect in response to receiving the emitted energy.

However, Xia discloses an anode that is a display screen (See Column 1 Lines 29-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an anode that is a display screen as disclosed in Xia because it aids in providing good display characteristics.

In regards to claim 17, Simmons fails to disclose the following:

a) display screen includes one or more phosphors operable for emitting photons in response to receiving the emitted energy.

However, Xia discloses a display screen that has phosphors (See Column 1 Lines 37-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include a display screen that has phosphors as disclosed in Xia because it aids in providing the luminescent display.

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10. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049) and Hu (U.S. Patent No. 6,328,620).

In regards to claim 21, Moyer discloses the following:

- a) an electron supply layer (13) (See Figure 1);
- b) an insulator layer (15) formed on the electron supply layer and having an opening defined within (See Figure 1); and
- c) a cathode layer (14) (See Figure 1).

In regards to claim 21, Moyer fails to disclose the following:

- a) a tunneling layer formed on the electron supply layer in the opening.

However, Simmons discloses a tunneling layer (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer as disclosed in Simmons because it aids in providing a layer for electrons to travel.

- b) the emitter has been subjected to an annealing process to increase the supply of electrons tunneled from the electron supply layer to the cathode layer for energy emission.

However, Hu discloses an annealing process (See Column 3 Lines 45-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Simmons to include an annealing process as disclosed in Hu because it aids in enhancing the emission of electrons.

In regards to claim 22, Moyer discloses the following:

- a) emitting photons in addition to the electron emission (See Column 3 Lines 2-3).

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11. Claims 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049), Hu (U.S. Patent No. 6,328,620) and Potter (U.S. Patent No. 5,703,380).

In regards to claim 23, Moyer fails to disclose the following:

a) tunneling layer is a metal cluster dielectric.

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

In regards to claim 25, Moyer fails to disclose the following:

a) a tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , WSiN , TaAlO_xN_y , TaAlO_x , and AlO_xN_y .

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

12. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049), Hu (U.S. Patent No. 6,328,620) and Chuman et al. (U.S. Patent No. 6,023,124).

In regards to claim 24, Moyer fails to disclose the following:

a) emission rate greater than about 0.01 Amps per square centimeter.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious

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to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an emission current greater than 1×10^{-6} Amps per square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

Additionally, the applicant has not established the critical nature of the emission rate greater than .01 Amps. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

13. Claim 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049), Hu (U.S. Patent No. 6,328,620) and Liu et al. (U.S. Patent No. 6,118,136).

In regards to claim 26, Moyer fails to disclose the following:

a) tunneling layer has a thickness less than 500 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 500 Angstroms. "The law is replete with cases in which the difference between the claimed

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invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results

In regards to claim 27, Moyer fails to disclose the following:

a) the tunneling layer has a thickness between about 50 Angstroms and about 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 50 to about 250 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

14. Claims 28 and 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049), Hu (U.S. Patent No. 6,328,620) and Xia (U.S. Patent No. 6,034,479).

In regards to claim 28, Moyer discloses the following:

a) an integrated circuit including the emitter wherein the emitter emits a visible light source (See Figure 1).

In regards to claim 28, Moyer fails to disclose the following:

a) a lens for focusing the visible light source, wherein the lens is coated with a transparent conducting surface to capture electrons emitted from the emitter.

However, Xia discloses a screen (16) (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a screen as disclosed in Xia because it aids in providing the luminescent display.

In regards to claim 30, Moyer discloses the following:

a) an integrated circuit including the emitter (See Figure 1).

In regards to claim 30, Moyer fails to disclose the following:

a) a focusing device for converging the emissions from the emitter (See Column 1 Lines 29-43).

However, Xia discloses a device for converging emissions from the emitter (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a device for converging emissions from the emitter as disclosed in Xia because it aids in providing the luminescent display.

In regards to claim 31, Moyer fails to disclose the following:

a) a microprocessor; the electronic device coupled to the microprocessor; and memory coupled to the microprocessor, the microprocessor operable of executing instructions from the memory to transfer data between the memory and the electronic device (See Figure 3).

However, Xia discloses a microprocessor (33) (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the

semiconductor device of Moyer to include a microprocessor as disclosed in Xia because it aids in controlling the circuit.

In regards to claim 32, Moyer fails to disclose the following:

a) electronic device is a storage device.

However, Xia discloses a storage device (34) device (See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a storage device as disclosed in xia because it provides a medium to store data.

In regards to claim 33, Moyer fails to disclose the following:

a) electronic device is a display device.

However, Xia discloses a field emission display device (See Column 1 Lines 29-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a display device as disclosed in Xia because field emission is important in providing good portable screens with good display characteristics.

15. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Simmons et al. (U.S. Patent No. 5,825,049), Hu (U.S. Patent No. 6,328,620) and Gibson et al. (U.S. Patent No. 5,557,596).

In regards to claim 29, Moyer fails to disclose the following:

a) a storage medium in close proximity to the emitter, the storage medium having a storage area being in one of a plurality of states to represent the information stored in that storage area; such that an effect is generated when the electron beam current bombards the storage area; the magnitude of the effect depends on the state of the storage area; and the information stored in the storage area is read by measuring the magnitude of the effect (See Column 2 Lines 15-20).

However, Gibson discloses a storage device (See Figure 1 and Column 2 lines 10-20). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a storage device as disclosed in Gibson because it provides a medium to store data.

16. Claims 34 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281), Hu (U.S. Patent No. 6,328,620) and Simmons et al. (U.S. Patent No. 5,825,049).

In regards to claim 34, Moyer discloses the following:

- a) an electron supply surface (See Figure 1);
- b) an insulator layer (15) formed on the electron supply surface and having a first opening defined within (See Figure 1);
- c) a conductive layer (18) (See Figure 1); and
- d) a cathode layer (See Figure 1).

In regards to claim 34, Moyer fails to disclose the following:

- a) an adhesion layer disposed on the insulator layer, the adhesion layer defining a second opening aligned with the first opening.

However, Huang et al. ("Huang") discloses an adhesion layer (See Column 3 Lines 60-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an adhesion layer as disclosed in Huang because it aids in providing improved adhesion among the layers.

b) a tunneling layer formed on the electron supply layer within the first, second, and third openings.

However, Simmons discloses a tunneling layer (See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer as disclosed in Simmons because it aids in providing a layer for electrons to travel.

c) an emitter subjected to an annealing process.

However, Hu discloses an annealing process (See Column 3 Lines 45-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an annealing process as disclosed in Hu because it aids in enhancing the emission of electrons.

In regards to claim 40, Moyer discloses the following:

a) emitting photons in addition to the electron emission (See Column 3 Lines 2-3).

17. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281), Hu (U.S. Patent No. 6,328,620), Simmons et al. (U.S. Patent No. 5,825,049) and Chuman et al. (U.S. Patent No. 6,023,124).

In regards to claim 35, Moyer fails to disclose the following:

a) emission rate of about .1 to about 1.0.

However, Chuman discloses an emission device that has an emission current greater than 1×10^{-6} Amps per square centimeter (See Column 2 Lines 17-28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include an emission current greater than 1×10^{-6} Amps per

square centimeter emission as disclosed in Chuman because it aids in providing a high luminance.

Additionally, the applicant has not established the critical nature of the emission rate of about .1 to about 1.0. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

18. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281), Hu (U.S. Patent No. 6,328,620), Simmons et al. (U.S. Patent No. 5,825,049) and Potter (U.S. Patent No. 5,703,380).

In regards to claim 36, Moyer fails to disclose the following:

a) tunneling layer is a metal cluster dielectric selected from the group consisting of TiO_x , TaO_x , WSiN , TaAlO_xN_y , TaAlO_x , and AlO_xN_y .

However, Potter discloses layers of alloys of titanium and tungsten (See Column 6 Lines 12-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include layers of alloys of titanium and tungsten as disclosed in Potter because it aids in providing good ohmic contact.

19. Claims 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moyer (U.S. Patent No. 5,473,218) in view of Huang et al. (U.S. Patent No. 5,702,281), Hu (U.S. Patent No. 6,328,620), Simmons et al. (U.S. Patent No. 5,825,049) and Liu et al. (U.S. Patent No. 6,118,136).

In regards to claim 37, Moyer fails to disclose the following:

a) tunneling layer has a thickness between 50 to 250 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 50 to about 250 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 38, Moyer fails to disclose the following:

a) tunneling layer has a thickness of about 100 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a

tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 100 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 39, Moyer fails to disclose the following:

a) tunneling layer has a thickness of less than about 500 Angstroms.

However, Liu discloses a tunneling layer that has a thickness of 40-60 Angstroms (See Column 4 Lines 40-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Moyer to include a tunneling layer that has a thickness of 40-60 Angstroms as disclosed in Liu because it aids in improving the speed of the device.

Additionally, the applicant has not established the critical nature of the dimension of 500 Angstroms. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

Conclusion

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian, can be reached on 703-308-4905. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML
October 23, 2002



**AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800**